

Kibali Gold Mine sulphide concentrate treatment – Understanding the pre-oxidation of sulphide concentrates

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ABSTRACT

Kibali gold mine gold processing plant treats both free milling/oxide and partially refractory ores. The flotation concentrate, is subjected to ultrafine grinding in 8 parallel FLS VXP 2500 ultrafine grinding (UFG) mills and undergoes a two stage pre-oxidation process at controlled pH of 10.2, prior to cyanide addition. The primary objective of the pre-oxidation is to reduce the reactivity of sulphide surfaces and thus reduce cyanide and oxygen demand downstream. The process has demonstrated complex interactions amongst operational parameters of feed density, pH and dissolved oxygen concentration.

This work seeks to elucidate the impact of these interactions on gold dissolution and cyanide consumption. Also presented, is the impact of seeking concomitant liberation of gold by aggressive preoxidation conditions against the release of deleterious elements. Following the aggressive pre-oxidation conditions, plant performance results have shown that the exothermic sulphide oxidation reactions not only increase temperatures but generate cyanicides consistent with observed high cyanide consumption and poor dissolved oxygen concentration.

From the extensive analysis of plant data and laboratory testwork, carried out over the years, the Kibali Mine Processing plant, has established and defined a niche operating domain for optimal pre-oxidation processes. This has been evident in the drop in the sulphide concentrate residues from above 5g/t in the first year after commissioning to below 3g/t, currently achieved.

Keywords: preoxidation, Sulphide concentrates, Refractory ores, Dissolved oxygen, Aachen Assisted Extended Leach